



**SOUTH EASTERN KENYA UNIVERSITY**  
**UNIVERSITY EXAMINATIONS 2016/2017**

**SECOND SEMESTER EXAMINATION FOR THE DEGREES OF**  
**BACHELOR OF SCIENCE (CHEMISTRY) AND BACHELOR OF**  
**EDUCATION (SCIENCE)**

**SCH 206: ORGANIC ACIDS, AMINES, ESTERS AND PHENOLS**

**DATE: 18<sup>TH</sup> APRIL, 2017**

**TIME: 8.00-10.00 A.M**

**INSTRUCTIONS TO CANDIDATES**

- (a) Answer **question One** and any other **Two questions**
  - (b) Question 1 **carries 30 marks** while the other questions **carry 20 marks** each
  - (c) *Illustrate your answers with well labeled diagrams where appropriate*
  - (d) No written materials allowed.
  - (e) Write all answers in the booklet provided.
  - (f) Do not forget to write your Registration Number.
  - (g) Do not write any answers on this question paper
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**QUESTION 1 (30 MARKS)**

- a) Write the structural formula for each of the following compounds:
  - i. *m*-iodophenol
  - ii. isobutyl methyl ketone
  - iii. 2-butenal
  - iv. 1,3-diphenyl-2-propen-1-one
  - v. magnesium 2-chloropropanoate

- vi. trimethylacetic acid
- vii. 2-methyl-4-ethyloctanoic acid
- viii. isopropyl acetate
- ix. diphenylamine
- x. N,N-dimethylacetamide
- xi. acetophenone

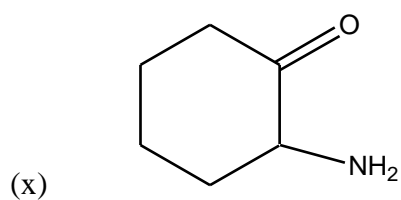
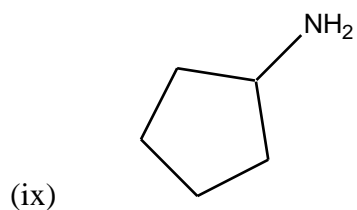
(10 marks)

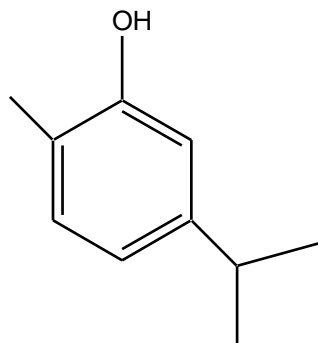
- b) Neglecting enantiomerism, give structural formulas and IUPAC names for the seven carbonyl compounds of formula  $C_5H_{10}O$ .

(7 marks)

- c) Give the names of each of the following compounds

- (i)  $CH_3CH_2CHOHCH_2CHO$
- (ii)  $CH_3CHC(CH_3)COCH_3$
- (iii)  $C_6H_5CH_2CO_2H$
- (iv)  $(CH_3CO)_2O$
- (v)  $C_6H_5COCl$
- (vi)  $CH_3CH_2CO_2CH_2CH_3$
  
- (vii)  $HCCCH_2CO_2H$
- (viii)  $CH_3CH_2CONH_2$





(xi)

(xii)  $\text{CH}_3\text{COCH}_2\text{CH}_2\text{CHO}$

(12 marks)

**QUESTION 2 (20 MARKS)**

a) Write balanced equations, for the reaction of phenylacetaldehyde with:

- i. Tollens' reagent
- ii.  $\text{CrO}_3/\text{H}^+$
- iii. Cold dilute  $\text{KMnO}_4/\text{H}^+$
- iv. Ethyl alcohol, dry  $\text{HCl}$
- v. Hydroxylamine
- vi.  $\text{LiAlH}_4/\text{H}_3\text{O}^+$
- vii.  $\text{C}_6\text{H}_5\text{MgI}$ , then  $\text{H}_2\text{O}$
- viii.  $\text{HCCLi}$ , then  $\text{H}_3\text{O}^+$
- ix.  $\text{CN}^-$ ,  $\text{H}_2\text{O}/\text{HCl}$
- x. 2,4-dinitrophenylhydrazine

(12 marks)

b) Write equations for all steps in the synthesis of the following from acetophenone:

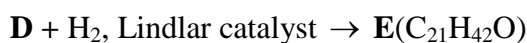
- i. Ethylbenzene
- ii. Benzoic acid

iii. 2-phenyl-2-butanol

(8 marks)

**QUESTION 3 (20 MARKS)**

(a) The sex attractant of the douglas-fir tussock moth has been synthesized in the following way. Give the structure of the sex attractant and all intermediates.



(12 marks)

(b) Write short chemical reactions on how you can differentiate the following compounds:

i. acetone and + acetic acid

ii. ethanol and phenol

iii. acetophenone and phenylacetaldehyde

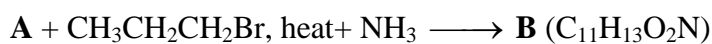
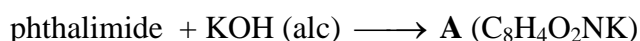
iv. ethyl phenyl ketone and methyl phenyl ketone

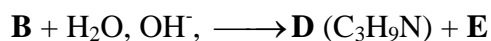
v. acetone and chloroform

(8 marks)

**QUESTION 4 (20 MARKS)**

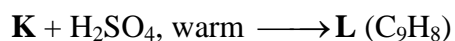
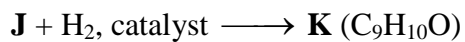
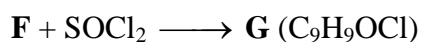
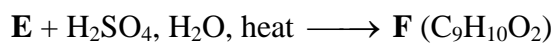
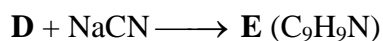
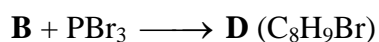
(a) Give the structural formulas of compounds A through D.





(8 marks)

(b) Give the structures of all the intermediates.



(12 marks)

### QUESTION 5 (20 MARKS)

(a) Give structures of the principal organic products of the reaction of *o*-cresol with:

- i. aqueous NaOH
- ii. aqueous NaHCO<sub>3</sub>
- iii. KMnO<sub>4</sub>/heat
- iv. acetic acid
- v. acetic anhydride

(10 marks)

(b) Write an equation for the reaction of ethyl benzoate with

- i. hot aqueous sodium hydroxide
- ii. ammonia (heat)
- iii. methylmagnesium iodide (two equivalents), then  $\text{H}_3\text{O}^+$
- iv. lithium magnesium hydride (two equivalents), then  $\text{H}_3\text{O}^+$

(10 marks)